SUBSYSTEM: SEPARATION

ITEM NAME: Aft Heat Seal

PART NO.: 10317-0006-802, -803
10317-0005-801, 10317-0004-801
99615-0004-702, 9011-0017

FM CODE: A03

ITEM CODE: 30-02-08

REVISION: Basic

CRITICALITY CATEGORY: 1R

REACTION TIME: Immediate

NO. REQUIRED: 4 sets of each per SRB

DATE: March 1, 2002

CRITICAL PHASES: Boost

SUPERCEDES: May 3, 1994

FMEA PAGE NO.: B-39A

ANALYST: T. Burke/S. Parvathannei

SHEET 1 OF 3

APPROVED: S. Parvathannei

CN 044

FAILURE MODE AND CAUSES: Premature fracture of two Aft Heat Seals caused by:

- o Material defect
- o Improper fracture groove
- o Overstress during proof pressure test.
- o Aerodynamic loading

FAILURE EFFECT SUMMARY: Premature fracture and resultant loss of two aft heat seals will lead to premature firing of two BSM. Loss of mission, vehicle and crew will result during separation from re-contact between the SRB and Orbiter ET.

REDUNDANCY SCREENS AND MEASUREMENTS:

1. N/A
2. Fail -Loss of redundancy not detectable by flight or ground crew.
3. Pass

RATIONALE FOR RETENTION:

A. DESIGN

Design Specification is USA SRBE 10SPC-0067.

- o Material - 1100-0 aluminum 0.063 inch thick. (All Failure Causes)

- o Fracture designed to occur along circumferential groove. (Improper Fracture Groove)

- o Minimum material at the bottom of the groove 0.024 inch. (Improper Fracture Groove)

- o Each disk proof loaded to 25-30 psig. (Improper Fracture Groove)

- o Four units included in qualification tests of aft BSM per CSD 5180-79- 109. Two of four subjected to temperature cycling, altitude cycling, rain and aerodynamic heating. (All Failure Causes)

- o Two units included in qualification tests of Aft BSM per delta qualifica- tion per CSD 5596-88-3. These units subjected to thermal cycling, vibration and ordnance shock. Test performed to qualify new cork bonding procedure with one half inch cork.

- o Stress analysis per USA SRBE document BPC-ANAL-003-87 shows that an ultimate factor of safety of 1.44 exists for the aft heat seal assembly for proof testing during fabrication. This load is greater than the maximum predicted load during ascent. (Aerodynamic Loading)

B. TESTING

- o All listed vendor related tests are witnessed or monitored by vendor (or sub-tier vendor) QA personnel. When no designated QA organization exists at vendor, tests are witnessed/monitored by CSD QA personnel or tests are evaluated for compliance with specification requirements by CSD personnel.

- o Each disk is subjected to proof test of 25-30 psig. (All Failure Causes)

- o All KSC related tests are witnessed or monitored by USA SRBE or SPC personnel.

C. INSPECTION

- o All listed vendor related inspections are conducted 100% by vendor (or sub-tier vendor) QA personnel. Where no designated QA organization exists at a vendor, inspections are witnessed/monitored by CSD QA personnel or inspection records are evaluated for compliance with quality system requirements by CSD QA personnel.

- o All listed KSC related inspections are conducted 100% by USA SRBE or SPC personnel.

VENDOR RELATED INSPECTIONS

- o MATERIAL DEFECT

  - All material certifications including chemical and physical properties are verified. (Material Defects)

- o OVERSTRESS OF FRACTURE GROOVE

  - Penetrant inspection of heat seal following proof pressure test. (All Failure Causes)

KSC RELATED INSPECTIONS

- o Receiving Inspection (All Failure Causes)

  - Each Aft Heat Seal is inspected fordamage, corrosion, misalignment or moisture per OMRSD File V, Vol. I, requirement number B000FL.005.

D. FAILURE HISTORY

O Failure Histories may be obtained from the PRACA database.

E. OPERATIONAL USE

- o Not applicable to this failure mode.